

WHAT IS CLAIMED IS:

1. A frequency synthesizer comprising:

a first synthesizer which outputs signal of which frequency is within one of a plurality of frequency bands;

a second synthesizer which outputs a fixed frequency signal;

a first mixer which mixes the signal output from the first synthesizer with the fixed frequency signal output from the second synthesizer;

a first divider which divides a signal output from the first mixer by a first division ratio;

a second divider which divides the fixed frequency signal output from the second synthesizer by a second division ratio;

a second mixer which mixes the signal output from the first synthesizer with a signal output from the second divider;

a third divider which divides a signal output from the second mixer by a third division ratio to output a signal to be used as a first local signal; and

a switch which outputs either a signal output from the first divider or a signal output from the third divider as a second local signal.

2. The frequency synthesizer of claim 1, wherein said first divider includes a first  $\pi/2$  phase shifter and said third divider includes a second  $\pi/2$  phase

shifter, and wherein said switch outputs first and second phase signals having phases different from each other by  $\pi/2$ .

5 3. The frequency synthesizer of claim 1, further comprising a first filter inserted between said first mixer and said first divider, and a second filter inserted between said second mixer and said third divider.

10 4. The frequency synthesizer of claim 1, further comprising a fourth divider which divides a signal output from said switch by a fourth division ratio.

15 5. The frequency synthesizer of claim 2, further comprising a fourth divider which divides a signal output from said switch by a fourth division ratio, and a fifth divider which divides a signal output from said switch by a fifth division ratio.

6. The frequency synthesizer of claim 2, further comprising a sixth divider inserted between said third divider and said switch.

20 7. A frequency synthesizer comprising:  
a first synthesizer which outputs a signal of which frequency is within one of a plurality of frequency bands;

25 a second synthesizer which outputs a fixed frequency signal;

a first divider which divides the fixed frequency signal output from the second synthesizer by a first

division ratio;

a mixer which mixes the signal output from the first synthesizer with a signal output from the first divider;

5 a second divider which divides a signal output from the mixer by a second division ratio to output a first local signal;

10 a third divider which divides the fixed frequency signal output from the second synthesizer by a third division ratio to output a second local signal; and

a fourth divider which divides the signal output from the first synthesizer by a fourth division ratio to output a third local signal.

15 8. The frequency synthesizer according to claim 7, further comprising a first filter inserted between said first divider and said mixer, and a second filter inserted between said mixer and said second divider.

9. A frequency synthesizer comprising:

20 a first synthesizer which outputs a signal of which frequency is within one of a plurality of frequency bands;

a second synthesizer which outputs first fixed frequency signal;

25 a third synthesizer which outputs second fixed frequency signal;

a first mixer which mixes the signal output from

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the first synthesizer with the second fixed frequency signal output from the third synthesizer;

5 a first divider which divides a signal output from the first mixer by a first division ratio to output a first local signal;

a second divider which divides the first fixed frequency signal output from the second synthesizer by a second division ratio to output a second local signal; and

10 a third divider which divides the signal output from the first synthesizer by a third division ratio to output a third local signal.

10. The frequency synthesizer of claim 7, further comprising:

15 a second mixer which mixes a signal output from said fourth divider with a signal output from said third divider; and

20 a switch which outputs either a signal output from the second mixer or a signal output from the third divider as a second local signal.

11. A multi-band radio apparatus comprising:

a frequency synthesizer including:

25 a first synthesizer which outputs signal of which frequency is within one of a plurality of frequency bands;

a second synthesizer which outputs a fixed frequency signal;

a first mixer which mixes the signal output from the first synthesizer with the fixed frequency signal output from the second synthesizer;

5 a first divider which divides a signal output from the first mixer by a first division ratio;

a second divider which divides the fixed frequency signal output from the second synthesizer by a second division ratio;

10 a second mixer which mixes the signal output from the first synthesizer with a signal output from the second divider;

a third divider which divides a signal output from the second mixer by a third division ratio to output a signal to be used as a first local signal; and

15 a switch which outputs either a signal output from the first divider or a signal output from the third divider as a second local signal;

20 a quadrature demodulator connected to the frequency synthesizer, which demodulates a received signal by use of said reception local signal; and

a quadrature modulator connected to the frequency synthesizer, which modulates a signal to be transmitted by use of said transmission local signal.

12. A multi-band radio apparatus comprising:

25 a frequency synthesizer including:

a first synthesizer which outputs a signal of which frequency is within one of a plurality of

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frequency bands;

a second synthesizer which outputs a fixed frequency signal;

5 a first divider which divides the fixed frequency signal output from the second synthesizer by a first division ratio;

a mixer which mixes the signal output from the first synthesizer with a signal output from the first divider;

10 a second divider which divides a signal output from the mixer by a second division ratio to output a first local signal;

15 a third divider which divides the fixed frequency signal output from the second synthesizer by a third division ratio to output a second local signal; and

a fourth divider which divides the signal output from the first synthesizer by a fourth division ratio to output a third local signal.

20 a quadrature demodulator connected to the frequency synthesizer, which demodulates a received signal by use of said reception local signal;

25 a quadrature modulator connected to the frequency synthesizer, which modulates a signal to be transmitted by use of said first transmission local signal; and

a frequency converter connected to the quadrature modulator and the frequency synthesizer, which converts

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a frequency of a signal output from the quadrature modulator by use of said second transmission local signal.

13. A frequency synthesizer comprising:

5       a first signal generator which outputs a first signal of which frequency is within one of a plurality of frequency bands;

          a second signal generator which outputs a second signal having a fixed frequency;

10       a first mixer which mixes the first and second signals and outputs a first mixed signal;

          a first divider which divides the first mixed signal by a first division ratio and outputs a first divided signal;

15       a second divider which divides the second signal by a second division ratio and outputs a second divided signal;

          a second mixer which mixes the first signal and the second divided signal and outputs a second mixed  
20       signal;

          a third divider which divides the second mixed signal by a third division ratio to output a first local signal; and

          a switch which selects either the first divided  
25       signal or the first local signal and outputs a second local signal.

14. A frequency synthesizer comprising:

a first signal generator which outputs a first signal of which frequency is within one of a plurality of frequency bands;

5 a second signal generator which outputs a second signal having a fixed frequency;

a first divider which divides the second signal by a first division ratio and outputs a first divided signal;

10 a mixer which mixes the first signal with the first divided signal and outputs a mixed signal;

a second divider which divides the mixed signal by a second division ratio to output a first local signal;

15 a third divider which divides the second signal by a third division ratio to output a second local signal; and

a fourth divider which divides the first signal by a fourth division ratio to output a third local signal.

15. A frequency synthesizer comprising:

20 a first signal generator which outputs a first signal of which frequency is within one of a plurality of frequency bands;

a second signal generator which outputs a second signal having a first fixed frequency;

25 a third signal generator which outputs a third signal having a second fixed frequency;

a mixer which mixes the first signal with the third signal to output a mixed signal;

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a first divider which divides the mixed signal by  
a first division ratio to output a first local signal;

a second divider which divides the second signal  
by a second division ratio to output a second local  
5 signal; and

a third divider which divides the first signal by  
a third division ratio to output a third local signal.

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